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ROTUNDA

Winter 1971
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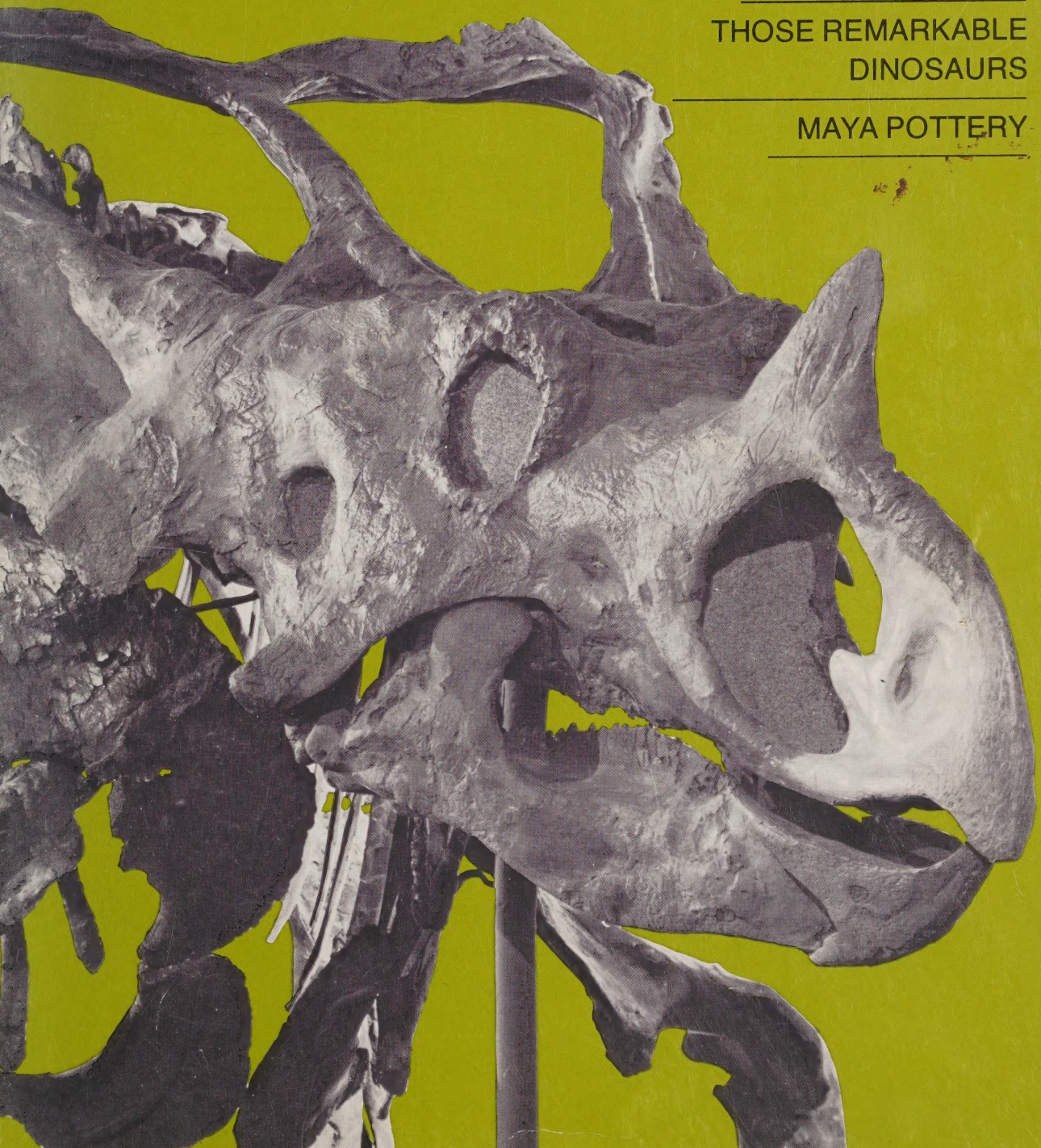
THOSE REMARKABLE DINOSAURS

MAYA POTTERY



ROTUNDA

the bulletin of The Royal Ontario Museum

Contents

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Cover illustration:
Skeleton of Chasmosaurus, *one of those remarkable dinosaurs (page 4).*

Vol. 4, No. 1 Winter 1971

Spotlight with the Editor

Past, present and future at the ROM

ONE TUSK MASTODON

Elsewhere in this issue is a photo story on the new environment displays in the Vertebrate Paleontology Galleries. Silent Sam, the industrious paleontologist, has become well known in the area's introductory region, open for some time. But wait until you encounter our massive mastodon, with his single eight-foot-long tusk, the displays on the evolution of man and other features of these new galleries, open to the public January 26.

INNER MAN

Youngsters really will be able to satisfy their insatiable appetite for dinosaurs when the ROM's new restaurant complex opens shortly. The Children's Cafeteria will be decorated as a dinosaur den, featuring a 25-foot-long mural of one of the prehistoric beasts. Other sections of the complex include a tastefully decorated adult cafeteria and a Lounge reserved for Members, another excellent reason for joining the ROM now.

TOMB FOR THE MUMMY

Not all the tombs of ancient Egypt were as elaborate as that of the famous King Tutankhamun. Within a few weeks, Museum visitors will be able to see a recreation of a much more modest burial chamber of about 1350 B.C. It is based on a tomb that was discovered at the site of Deir el-Medina, in western Thebes, by a French expedition in 1928. The chamber is small, measuring only eight feet square. But in it will be the burial coffins of a man, his wife and their infant child. The woman's coffin is real, that of *Ta-Khat,* in the ROM collection. Approximately half the other items in the chamber also are genuine; the rest are reproductions, including the caskets of the husband, who has been given the fictitious

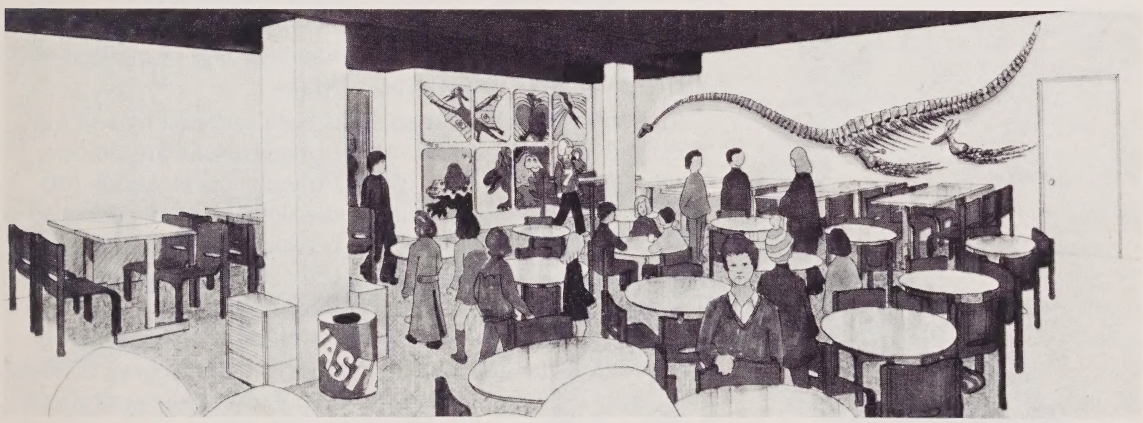
name, 'Parennefer,' and the child. Nicholas Millet, Curator of the Egyptian Department, says Parennefer has been imagined as a painter who was involved in doing the murals of King Tutankhamun's splendid tomb. Dr. Millet adds that the tomb exhibit and its explanatory graphic material is aimed primarily at giving fascinated children a taste of history along with "their shudders from the mummies."

ROMARAMA BLOOMS

Two events on the Toronto calendar, the Museum's ROMARAMA night, and the Toronto Garden Club's Spring Flower Show, come together this year on March 2nd. In ROMARAMA's short history (the first was in 1968), it has become noted as Fun Night at the Museum. Music, food, refreshments in such settings as the Bushmaster Bar, curators leading groups into mysterious recesses of laboratories and study collections, dancing, demonstrations, entertainment, amusing treasure hunts. Last year 3,500 people mobbed the ROM to take in ROMARAMA. This year there's an added attraction: a preview of the Spring Flower Show, being held for the first time at the Museum. In keeping with its new location, the Show's 1971 theme is *Gardens Through the Ages.* Such famous gardens as the Alhambra in 14th century Spain will be reproduced. Many of these displays may be seen ROMARAMA night. The entire Flower Show will be open to the public the following three days and nights. Mark well the dates for flower power at the ROM: ROMARAMA night March 2; Spring Flower and Garden Show March 3 to 6.

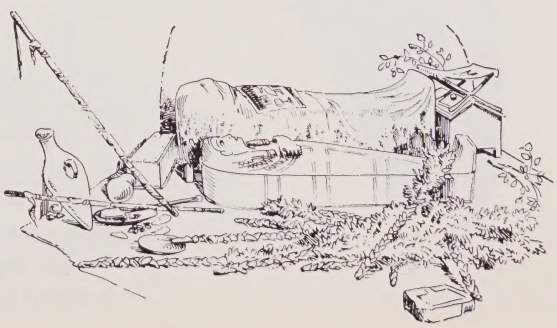
ANTIQUITIES FOR BROCK

Among its many distinctions, the ROM has one of North America's largest collections of Cypriote antiquities. So when Brock University in St. Catharines, Ontario, recently established a Museum of Cypriote Antiquities, the ROM offered a helping hand: a long-term loan of 18 Cypriote objects. These consist of pottery, limestone and terracotta figures, bronze, and glass, spanning about 2,000 years from the early Bronze Age to Roman times. Mrs. Neda Leipen, the ROM's Greek and Roman Department Curator, says the collection at Brock illustrates how the island of Cyprus amalgamated the surrounding cultures of ancient West Asia, Egypt and Grece.



Drawings, dinosaurs, good lighting, bright colours enliven new Children's Cafeteria.

Limestone statuette of votary carrying sacrificial animal, dating from 5th century B.C., *is one of Cypriote objects lent by* ROM *to Brock University.*



Egyptian tomb setting at ROM *is similar to this drawing which shows furnishings of tomb found in 1928 at site of Deir el-Medina.*

THOSE REMARKABLE DINOSAURS

L. S. Russell,

Chief Biologist

One of the most remarkable things about dinosaurs was the great length of time they flourished — something like 130 or 140 million years. The Age of the Dinosaurs began in the middle of the Triassic Period, about 200 million years ago. The dinosaurs became abundant and greatly varied during the Jurassic and Cretaceous Periods and did not disappear completely until the end of Cretaceous time, some 63 million years ago.

Dinosaur remains have been found on all continents and from the temperate zones to the tropics. However, the relative position of the continents to each other was very different in Mesozoic times from today and climatic zones also were in different positions relative to the continents.

Skeletons, such as those displayed at the Royal Ontario Museum, are the bare bones of the dinosaur story. But what were they like as living animals? How did they look? What did they eat? What was their habitat? How did they survive so long, and why did they become extinct?

First, let's consider what living animals are most closely related to dinosaurs. Most obvious, from the structure of their skeletons, is that they were reptiles. So in seeking analogies among living animals from which to deduce the nature of the dinosaurs, we look among the reptiles. Of all the living groups of reptiles, the one in which the skeleton shows the closest anatomical resemblances to that of dinosaurs is the crocodiles. Close relationships are indicated by the presence of two pairs of openings in the temporal region of the skull, by the numerous teeth set in sockets, and by the structure of the limbs.

There is another living group of vertebrate animals that shows clear evidence of relationships to dinosaurs. This is the class *Aves* or birds. Modern birds differ conspicuously from dinosaurs, the most obvious distinction being the presence of feathers. Only in the pelvic bones and the legs of modern birds are resemblances to dinosaurs obvious.

But an intermediate animal has been revealed by several remarkable fossils. *Archaeopteryx*, the ancient winged one, dates from near the close of the Jurassic period, about 140 million years ago. Anatomically the skeleton of *Archaeopteryx* is almost the ideal connecting link between the extinct dinosaurs and the birds as we know them today. This does not mean that *Archaeopteryx* represents the common ancestor. It lived at a time when dinosaurs were already well established, and it is too far along the line leading to modern birds to have been in the family tree of dinosaurs. But the *Archaeopteryx* skeleton has certain dinosaur-like features, such as numerous pointed teeth set in sockets, a moderately expanded brain case with traces of the temporal openings, a long, tapering, reptile-like tail, vertebrae with hollow ends instead of the complex ball-and-socket joints of later birds, and front limbs with the same functional fingers as in many dinosaurs. Like dinosaurs, *Archaeopteryx* had little or no breastbone, in striking contrast to the condition in modern birds, and the pelvic bones are more dinosaur-like than bird-like.

The environment in which prehistoric animals lived can be deduced to some extent by the structure of the fossil skeleton.

Thus creatures with paddle-like limbs must have spent most or all of their time in the water.

For other information on the environment, however, we depend on the geological evidence. This is based on the nature and structure of the rocks in which the fossil is preserved. Coarse sandstones or conglomerates represent the sands and gravels of swift streams. Clays or shales indicate deposition in quieter waters. A lateral transition from coarse to fine sediments suggests a shoreline. Much variability, with coarse and fine materials succeeding each other, may indicate river valley deposits, with channels and flood plains succeeding each other as conditions change. Coal seams record the presence of swamps, and suggest low-lying country with a mild climate. Sandstones with steeply inclined layers, and rounded sand grains with etched surfaces, indicate deposition by wind, probably in a desert.

Fossil sea shells indicate a marine environment. Dinosaur bones are rarely found in such an association, and where they are, the occurrence can be explained as the result of carcasses drifting out to sea. Much more common is the presence nearby of oyster shells or other fossils indicating brackish water or estuarine conditions. It seems clear that many dinosaurs lived in coastal plain areas, and their carcasses could easily have been washed into lagoons or brackish water swamps. However, most associations of dinosaur bones are with strictly fresh-water fossils, such as the shells of pond snails and river clams. Teeth and scales of gar pikes and bow fins are numerous in some dinosaur-bearing formations of late Cretaceous age. Such fish today live exclusively in fresh water.

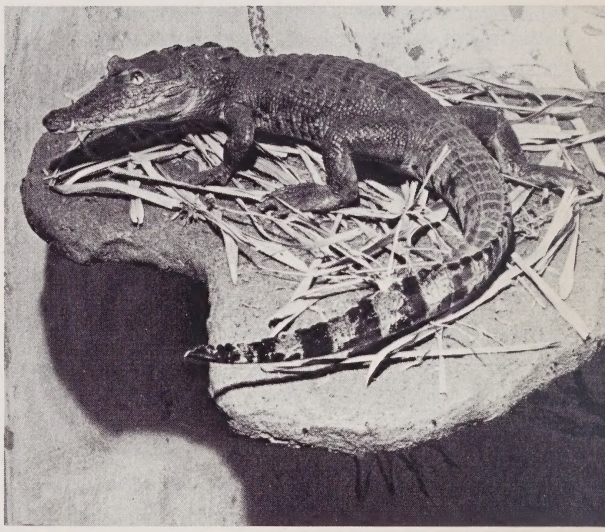
Archaeopteryx,
which existed 140 million years ago, is intermediate in anatomy between dinosaurs and modern birds although it was not the common ancestor.

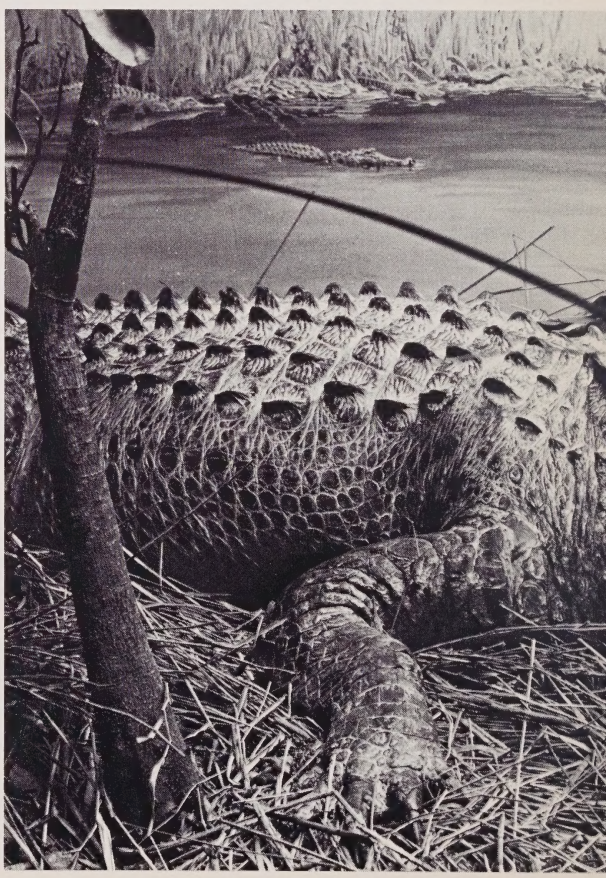
Fossils of plants are particularly informative. Leaves and wood of land plants indicate that dry land was nearby. Lily pads are evidence of pond conditions. Sea weeds would only appear as fossils in marine deposits. Plant fossils are also good climate indicators. Cycad remains are associated with the earlier dinosaurs, as are araucarias ("Monkey-puzzles") and ferns. This suggests a mild, equable climate. Later the predominant plants are conifers and the leafy trees that shed their foliage annually. These indicate cooler climate and seasonal fluctuations in temperature. Finally, fossil plants throw some light on the feeding habits of the dinosaurs, for at least they tell us what was available as food for the herbivorous kinds at different times in their geological history.

Predominant among the earliest dinosaurs were small, light-limbed forms with claws on the toes and many sharp teeth in the jaws. Even at this time the hind limbs were longer and more powerful than the front, indicating an agile, more or less bipedal reptile, obtaining its food by catching living prey with its claws and tearing the flesh with its sharp teeth before swallowing.

Flesh-eating dinosaurs persisted to the very end of dinosaurian history. Some lines retained the light build and the apparent ability to capture their prey by swift motion. Much more conspicuous, however, and probably more numerous, were the large flesh-eating dinosaurs. The trend in these was not only towards larger size, but also to a relative increase in size of the skull and jaws, more robust hind limbs, and more strongly clawed feet. Along with these increases there was a curious decrease in size and strength of the front limbs.

Allosaurus, the characteristic flesh-eater of late Jurassic time, measured 35 feet along the back from nose to tail, and probably stood about 15 feet high in its normal bipedal posture. The length of the front limb, from shoulder joint to tip of claws, was about half that of the corresponding measurement of the hind limbs. Some 60 million years later, towards the close of the Cretaceous Period and the Age of Dinosaurs, the giants *Albertosaurus* and *Tyrannosaurus* reached lengths of 30 feet





and 40 feet respectively. In these monsters the front limb was like a deformed vestige, about 1/5 the length of the hind limb, and equipped with only two miniature toes with seemingly little grasping ability.

It seems obvious that these great predators, with their powerful, clawed hind legs, and their long rows of dagger teeth, were well equipped to kill and feed upon the large plant-eating dinosaurs of their time. The herbivores were the only known land animals of the time large enough to satisfy the carnivore's capacity and many of them show skeletal structures best explained as defences against attack by a large predator.

It would appear that in these predators' mode of capturing and killing of prey the front limbs were redundant. In fighting amongst themselves, as modern reptiles do over food, such appendages might even be a liability. Nevertheless they would seem to have still served some function. The limb, small as it is, could still reach the mouth if the neck were moderately flexed. So these slender fingers and little claws might have helped to manipulate the food around the teeth, which were ideal for piercing but not much use for chewing. Perhaps the beasts used these fingers as toothpicks.

The largest of all dinosaurs made up the group known as the sauropods. They are sometimes called the giant amphibious dinosaurs, but they were not all giants and they surely were not all amphibious. The ancestral stock appears in rocks from Late Triassic time about 180 million years ago. The skeletons are of

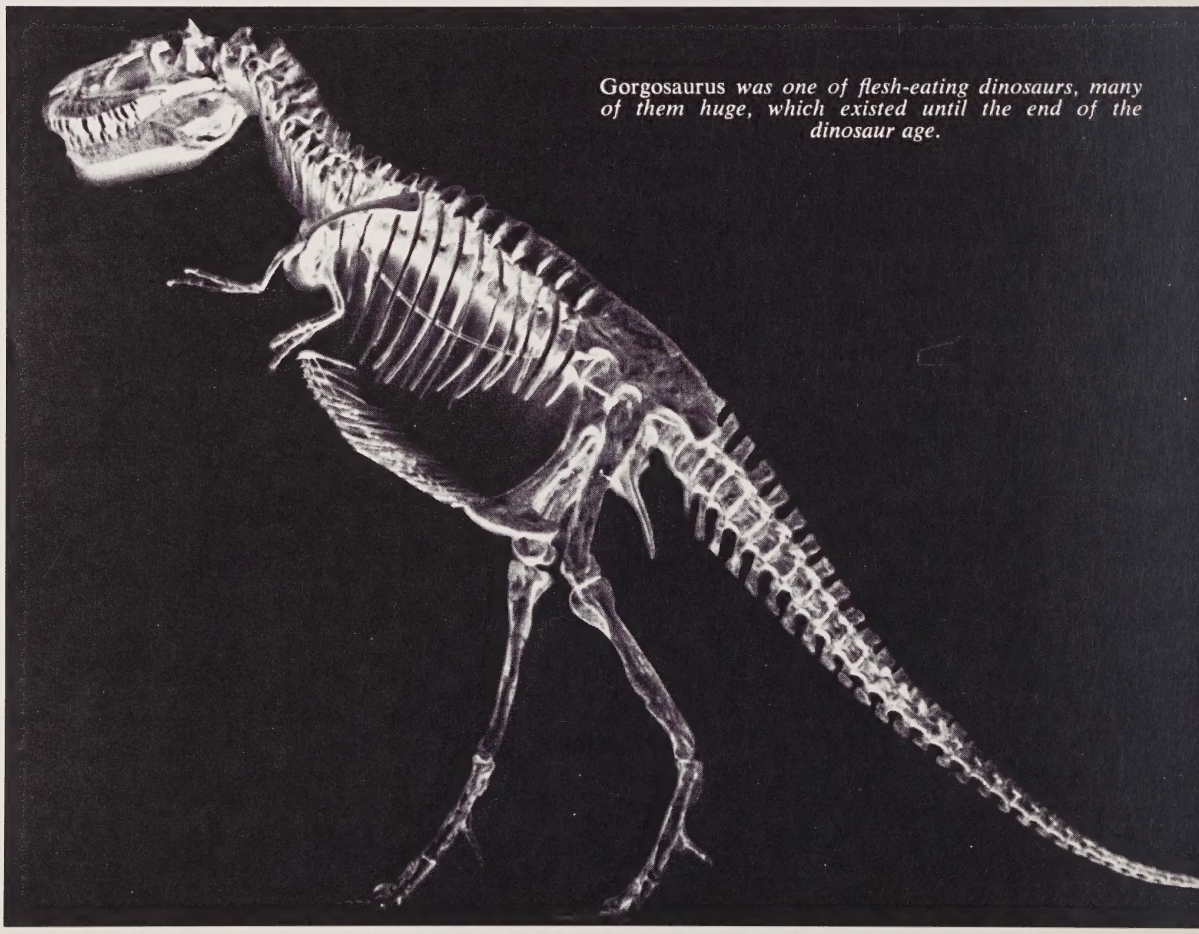
Dinosaurs show their relationship to modern reptiles. Most living reptiles creep on land although many kinds move easily in water.

Of all living reptiles, the crocodile and alligator have closest anatomical resemblance to dinosaurs.

moderate size, and show some evidence of bipedal locomotion, a heritage from their common ancestry with the flesh-eating dinosaurs.

From these so-called prosauropods there originated the true sauropods of Jurassic time, with a completely quadrupedal posture, small head, long neck, and usually long tail. These are perhaps the dinosaurs best known to the general public. They include the so-called *Brontosaurus* (properly *Apatosaurus*), the more slender *Diplodocus* with its whiplash tail, and the largest of all known land animals, *Brachiosaurus*. Some sauropods persisted on into late Cretaceous time. Their skeletons have never been found in Canada although the ROM possesses an incomplete skeleton of *Diplodocus*.

The larger sauropods measured from 65 to 90 feet in length, and although much of this is taken up by the long neck and tail, the bulk of the body alone must have been greater than that of any other dinosaur. To support this enormous weight the limb bones were pillar-like, as in the elephant, and the vertebrae were intricately hollowed to provide maximum strength for weight, and elaborate attachment areas for muscles. The feet, too, were like those of elephants, the toes mostly enclosed in a large fleshy pad, with three claws showing on the hind foot and only one on the front. This has been confirmed by footprints from early Cretaceous rocks in Texas which show the reptiles that made them were walking



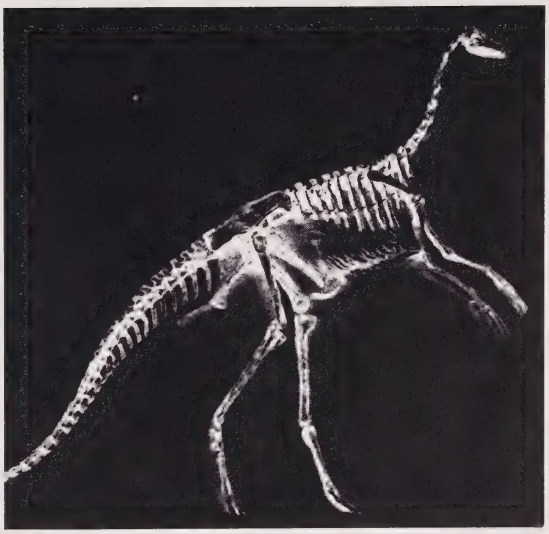
Gorgosaurus *was one of flesh-eating dinosaurs, many of them huge, which existed until the end of the dinosaur age.*

partly submerged in water. The position of the nostril openings well back on the top of the skull is also taken to indicate that the dinosaurs could stand submerged, with only the top of the head exposed for observation and breathing.

Certainly the sauropod dinosaurs were plant eaters; in all known skulls the teeth are blunt. Usually the dentition consists of a single row of short, spatulate teeth in the broadly rounded upper or lower jaw. In *Diplodocus*, the teeth are confined to the front of the long jaws, and are tall, slender pegs. What kind of plant matter would be bulky enough to serve as food for these monsters, and at the same time soft enough to be handled by such ridiculously weak chewing apparatus? To find suitable food we must go down the plant kingdom to the green algae, the spores of which are known from non-marine Jurassic rocks. Either as floating scum or bottom cover, these plants could have been present in vast quantities in the lakes and streams that were the habitat of the sauropods. The peculiar dentition of *Diplodocus* seems especially appropriate for taking this kind of food, for it could function as a combination rake and strainer.

All the other dinosaurs belong to a distinct group in which the pelvis is more like that of birds than reptiles, and in which the lower jaw has an extra bone in front, which is toothless, and in some supported a horny beak. The "bird-pelvis" dinosaurs (Ornithischia) vary greatly amongst themselves, but all seem to have originated in late Triassic time from small reptiles similar to the ancestors of the flesh-eaters and sauropods. A tendency towards bipedalism is again shown by the long hind legs and the slender, balancing tail.

By Jurassic time these plant eaters seemingly began to react to the depredations of the flesh-eating dinosaurs. Some retained the bipedal posture and the light limbs, and probably relied on speed for escape. Others, however, began to develop armour, and reverted to a quadrupedal stance, as this would provide better support for the extra weight. At first the armour consisted of plates of bone imbedded in the skin of the back, like exaggerated versions of



Light skeletal structure of Struthiomimus *and toothless beak placed it among "bird mimic" dinosaurs. Photo by author.*

Re-creation by the author of how Struthiomimus *may have looked. Long hind legs enabled it to out-run enemies, using extended tail for balance.*

the scutes present on crocodiles. To these were added spines, a further discouragement to attackers, and such spines on the top of the tail would provide a weapon of defence. The most bizarre of all the armoured dinosaurs was *Stegosaurus*, a Jurassic contemporary of *Apatosaurus* and *Diplodocus*. This had abandoned armour as body plating, but instead had a double row of nearly vertical plates down the back, like a gigantic, double-bladed saw. In addition there were large spines on the tail, as in some of the earlier armoured dinosaurs.

If attacked, surely the *Stegosaurus* would have twisted and lunged. In such motions the bony crest would have acted like a double-bladed saw, especially if, as seems likely, the plates were covered with a hard, horny overlay. If the predator tried to avoid the saw by attacking from the rear, the spiny tail, lashing from side to side, could inflict serious wounds.

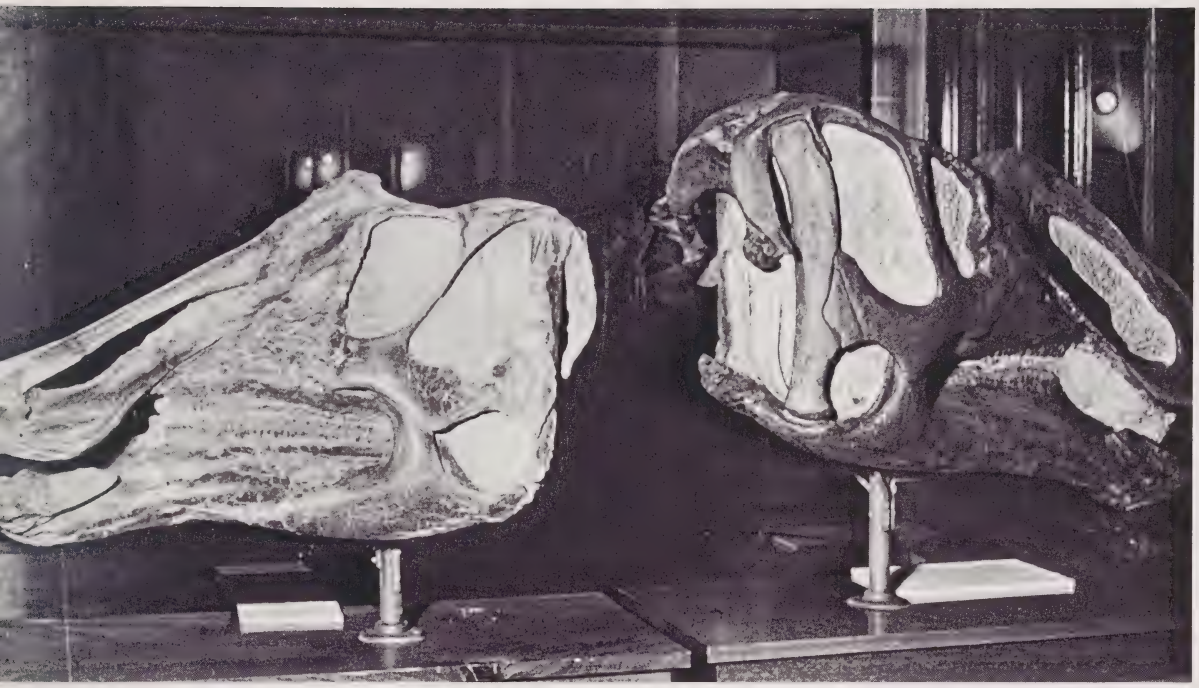
Stegosaurus' rather positive approach to defence seems to have been abandoned by its relatives in the subsequent Cretaceous Period. The armoured dinosaurs of that time had the body more or less completely encased in bony plates. Even the skull was plastered over with additional armour bone. The underparts, less vulnerable, had numerous pellets of bone in the skin. The tail also was armour-plated, and in some later examples terminated in a massive club head of dermal bone. If spines were present, they occurred along the flanks of the body, where they might discourage efforts to flip the dinosaur over and expose its softer underside. Mostly, however, the defence seems to have been like that of the armadillo: hunch up and defy the attacker to find a weak spot. The armoured tail, with or without the club, could cause a lot of damage if lashed from side to side.

The light-limbed, bipedal, bird-pelvis dinosaurs persisted to the very end of dinosaurian history, indicating that agility and speed were successful defences against predators. Such dinosaurs were of moderate size, some no bigger than a large turkey. From this stock, however, there appeared in Cretaceous time, large bipedal herbivores which may have achieved some immunity to attack by their bulk. The *Iguanodon* of early Cretaceous time stood about 15 feet high in its bipedal posture, and the duck-billed dinosaurs of the late Cretaceous were even larger. These were heavily built animals, with powerful hind limbs and tail.

That the duck-billed dinosaurs were good swimmers is suggested by the long tail, flattened from side to side, and this is confirmed by the presence of webbing impression between the fingers in one specimen. The front limbs were much smaller than the hind, but probably could support the body in a crouching posture. The teeth were closely spaced in the jaws to form a continuous grinding surface, apparently well adapted to chewing the more woody vegetation that was coming in during the Cretaceous Period. In the duck-billed dinosaur the teeth fit together to form a solid block, which was constantly renewed by replacement of the individual teeth.

Some duck-billed dinosaurs had flat heads, with expanded beaks, making the popular name very appropriate. In others, however, the nose bones were elevated in a prominent arch. Most remarkable were the hooded forms, in which the nose bones were expanded backwards and upwards to form a helmet-like crest on the top of the skull, or a long blade behind. But the most significant feature of these strange excrescences is that the nasal passages follow the extension of the bones, winding through the hood or extending to the end of the blade before turning to enter the throat region behind the jaws. The most plausible explanation is that the convoluted air passages trapped air when the dinosaur submerged its head while feeding on underwater plants. This could have prevented water from entering the throat through the nose.

The curious ability of dinosaurs in their evolution to reverse the bipedal trend and go back to a quadrupedal stance is shown again by the history of the horned dinosaurs. These appear to have originated at about the middle of Cretaceous time from small bird-pelvis dinosaurs in which the front limbs were still being used in standing and in slow walking. Short, wide jaws with pointed beaks, and batteries of grinding teeth farther back, permitted these



Skulls of two duck-billed dinosaurs, Kritosaurus *on the left,* Prosaurolophus, *right are in the National Museum of Natural Science, Ottawa. Photo by author.*

Author's restoration of crested, duck-billed Parasaurolophus. *Duck-billed dinosaurs were good swimmers and their teeth fitted together to form a solid block.*

Rotunda/Winter, 1971

dinosaurs to feed on tough vegetation. To provide greater attachment area for the powerful jaw muscles needed for this kind of chewing, the rear of the skull was expanded back over the neck, with openings in the surface to allow for muscle expansion. By late Cretaceous time this post-cranial crest was also serving as a shield for the vulnerable neck region. Concurrent with this crest expansion was the development of horns, one over the nose, and one over each eye. In the earlier representatives of the group the nose horn was the larger, but later the eye horns became long, a trend culminating in the well-known *Triceratops* ("three-horned face"). By this time the posterior crest had lost most of its function as a muscle support and had become a solid shield extending back to the shoulders.

The fossil bones of the horned dinosaurs indicate powerful hind limbs, articulated to work in a fore-and-aft direction. The front limbs, in contrast, were shorter, and normally held in a partially flexed position. This contrast evidently was a heritage of the period of near-bipedalism through which the ancestors of the horned dinosaurs passed. The powerful hind limbs could have been useful in pulling up stems or roots with the hooked beak, and would also have powered a forward lunge in which the horns could be driven into an attacker. But they would be awkward in side-to-side motion, so if the dinosaur defended itself by constantly presenting the horns and the shield to its enemy, it must have side-stepped with the flexed front limbs and pivoted on the less flexible hind limbs.

The external form of the living dinosaurs must be deduced mainly from the structure of the bones. In some cases we do have natural impressions and casts of the skin. These show us that the sauropods had an outer covering of polygonal scutes, half an inch or more in diameter. Duck-billed and horned dinosaurs had much smaller, more numerous scutes, with an occasional larger one to break the pattern. In one duck-billed dinosaur fossil the impression of a serrated horny beak was preserved. No fossil record of the skin in the flesh-eating dinosaurs has been found as yet, and it may be that in this group there was nothing harder on the surface than a leathery covering.

The area of origin and insertion of muscles

Protoceratops *andrewsi, in the* ROM, *was a primitive relative of horned dinosaurs. Also shown are casts of its eggs.*

Skull of Styracosaurus *(left) in National Museum of Natural Science, Ottawa. Horn and posterior crest protecting vulnerable neck region were defence against attack. Photo by author.*

Post-cranial crest of Chasmosaurus
protected the vulnerable neck region.

on the fossil bones can often be recognized by the peculiar texture of the surface. In any case, the same groups of muscles must have been present in the dinosaurs as in their living relatives, modified by differences in the skeleton, the posture, and the function.

Delving deeper into the soft anatomy of the dinosaurs becomes almost entirely a matter of assumptions based on analogy with living relatives. Both crocodiles and birds have a gizzard, a thick muscular portion of the stomach in which the hard parts of the food are crushed. Almost certainly the dinosaurs also had gizzards. In some of the dinosaur-bearing formations of western North America, accumulations of highly polished pebbles have been identified as gastroliths, stones swallowed by the dinosaurs to reinforce the crushing action of the gizzard. Birds do this on a much smaller scale.

The nature of the circulatory system in dinosaurs is worthy of consideration. The heart of the crocodile and that of the bird are very similar; the ventricles as well as the auricles are completely separated, so that venous blood from the body passes through the right chambers and to the lungs, from which it returns to the left auricle and ventricle and then through the right systemic arch to the body. The difference between the bird and the crocodile is that the latter retains the left systemic arch, through which some of the venous blood also returns to the body. In addition, there is a small opening between the two arches at their base, through which some mixing can occur.

It is quite proper to speculate that the circulatory system of dinosaurs had already passed from the crocodile to the bird stage of organization, and this might have been the secret of success during more than one hundred million years of dominance. A complete separation of venous and arterial blood would have permitted a richer supply of oxygen and nutriment to the tissues, a better functioning of renal-waste removal, and a stepped-up metabolism in general.

Birds and mammals can maintain a nearly constant body temperature, which makes them normally independent of the effects of en-

Cast of a piece of dinosaur skin of the sauropod group which included Brachiosaurus, *largest of all land animals. Such body covering, with its lack of insulation against body heat loss, may be one reason dinosaurs became extinct.*

vironmental temperature. Living reptiles differ little in body temperature from the surrounding medium, and when this cools, life activity slows down until a state of torpor is reached. I have long held that the great success of dinosaurs over other reptiles implies a fundamental difference, and that this difference was the possession by the dinosaurs of a better circulatory system and an independent body temperature.

Like birds and most reptiles, dinosaurs reproduced by laying eggs, which hatched externally. Fossil eggs which are almost certainly those of dinosaurs are known from Cretaceous rocks in Mongolia and southern France, and shell fragments have been found in North America. The shape is elongate, like that of crocodile eggs, but the thick, calcareous shell seems more like that of birds. Apparently dinosaurs laid their eggs in clusters, like other reptiles, and depended on the warmth of sun and soil to maintain the incubating temperature.

The spectacular history of the dinosaurs ends in tragedy, the seemingly sudden extinction of the entire group. Foreshadowing the event, the variety, if not the numbers, of dinosaurs decreases as we go from older rocks into those dating from the very close of Cretaceous time. By about 63 million years ago all dinosaurs, as far as we know, had disappeared.

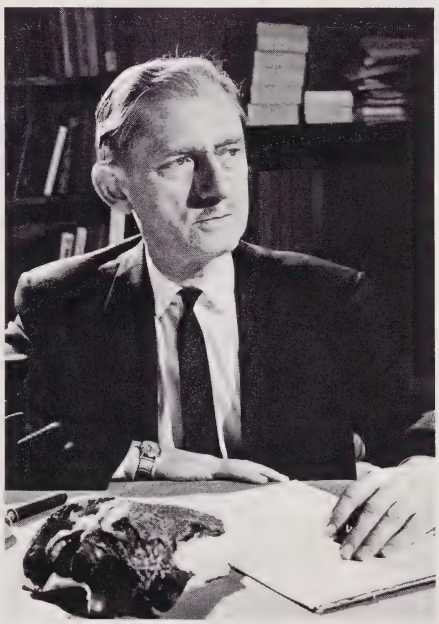
Such a dramatic event has long been the subject of widespread speculation. We can state confidently that the dinosaurs did not die off as a result of any cataclysmic physical event. All the geological evidence indicates that environmental changes at the transition from the Cretaceous to the Tertiary Period were slow and gradual. Epidemic disease, decrease in atmospheric oxygen, intensified solar radiation, and the attacks of egg-eating mammals are

implausible suggestions, for they should have affected other reptiles as well as the dinosaurs. The only other group of non-marine reptiles to die out at this time were the flying reptiles or pterosaurs, which were probably very similar to dinosaurs in physiology.

My personal theory starts with the hypothesis already mentioned and shown to be reasonable; that the dinosaurs had separate arterial and venous circulation and an independent body temperature. What they did not have, and what birds and mammals have had since very early in their history, is an insulating outer cover of feathers or hair. During most of the enormous time span represented by dinosaurian history, climatic conditions where these animals lived were mild, with little seasonal variation. But during the Cretaceous period, slowly at first but eventually in great abundance there appeared a new group of plants which annually shed their leaves, suspend their vascular circulation, and go into a period of dormancy during the winter season. Their appearance must represent a widespread climatic change, in which annual alternation of warm and cold seasons became the characteristic feature. The extremes were moderate for a long time, and many dinosaur groups continued to survive and proliferate. Eventually, however, the winter lows began to approach the critical level, for the dinosaurs could not hibernate like their cold-blooded relatives and they had no insulation to prevent loss of body heat. The incubating eggs, too, were vulnerable, for unlike birds' eggs they were not protected by the warmth of the parent's body.

No sudden, extreme shift to low temperatures is needed in this theory. A succession of winters, mild by our standards, but critical for dinosaurian survival, might have continued for several thousand years before bringing about total extinction, but in the geological record this is a moment of time. The world was open for the birds and mammals, ideally fitted to take possession of this vacated empire.

Dr. Loris S. Russell, the ROM's Chief Biologist, grew up in Calgary and attended the University of Alberta. He received an M.A. and Ph.D. from Princeton University and in 1937 was appointed Assistant Professor of Paleontology at the University of Toronto and Assistant Director of the Royal Ontario Museum of Paleontology. In 1950 he left the ROM to become Chief Zoologist at the National Museum in Ottawa. Later he was named Director of the Natural History Branch at that museum. Dr. Russell returned to the ROM in 1963 as head of the Life Sciences Division and when the divisions were abolished, he became Chief Biologist. Dr. Russell is a man of many interests and an authority in each of them. Of these, perhaps he is best known for his study of lamps and lighting in early Canada. His book on the subject, *A Heritage of Light* was published by University of Toronto Press in 1968.

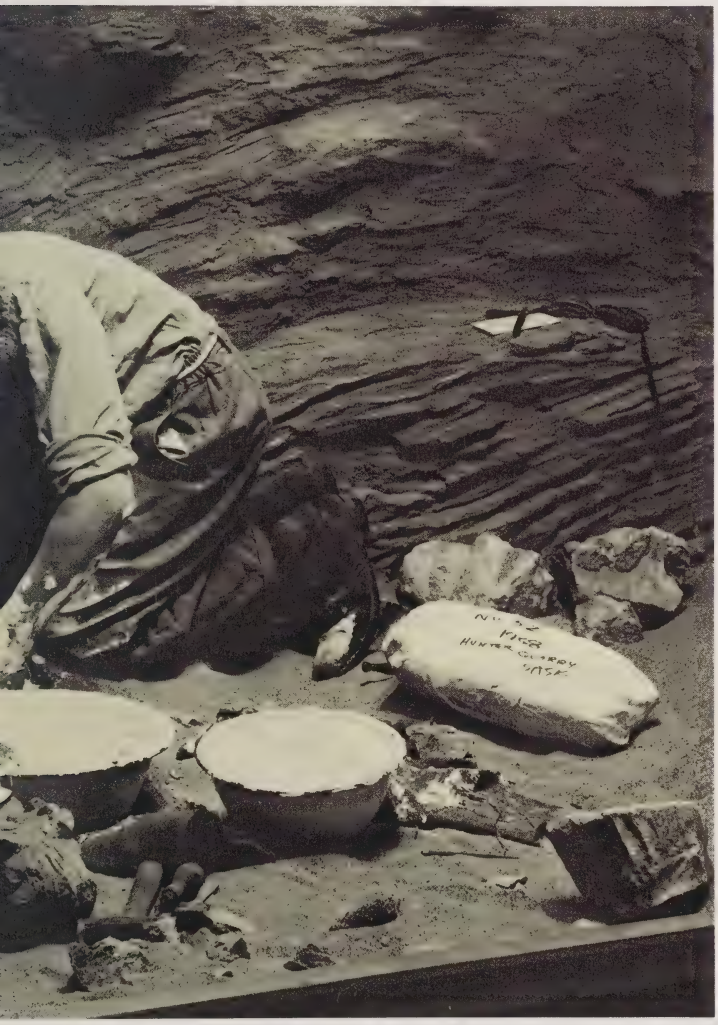


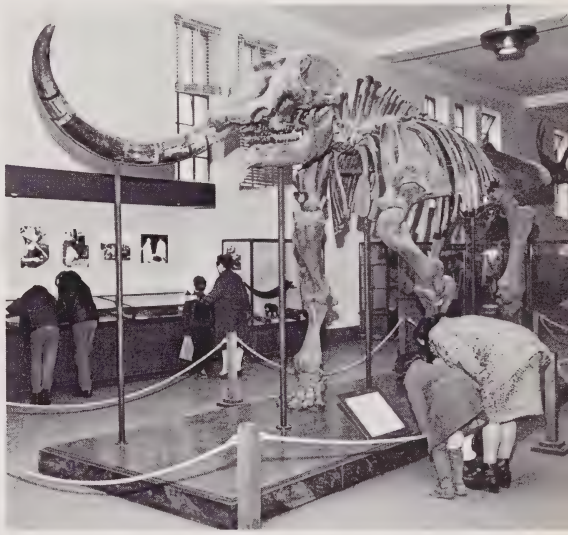
BARE BONES OF EVOLUTION

For many months, part of the Vertebrate Paleontology Galleries at the Royal Ontario Museum has been closed to visitors. Behind the hoardings, Curator Gordon Edmund and his staff, in consultation with designers, have been transforming the area to dramatically illustrate the evolution of man and prehistoric forms of vertebrate life.

Introductory area of the gallery describes the science of paleontology and illustrates some of its techniques. This is "Silent Sam," a display showing a paleontologist at work on a specific site, in this case a recreation of an area in Saskatchewan.

In his new setting, the Mastodon has his eight foot tusk refitted by technicians. In the same setting will be a giant Glyptodon of South America and an Irish Elk of Europe, both from the same geological age as the Mastodon.





The Mastodon ranged the Great Lakes area about ten thousand years ago. This is how the animal was displayed at the Museum for many years.

Portion of a herd with a difference: it shows major steps in the evolution of the horse. On the right is *Hyracotherium*, 60 million years old; in the centre, *Mesohippus*; and on the left, *Merychippus*, a relative youngster of 15 million years.

Merychippus maintains a wary watch as he grazes on real grass.

Another equine ancestor, *Pliohippus,* five million years old.

A modern horse and a Shetland pony.

The Shetland pony, a favourite of children, seems to convey happiness even as a skeleton.

Man is the only animal with a sense of time: an awareness of past, present and future. When he becomes a paleontologist, his studies can reveal not only his own past but that of other forms of life.

The LaBrea Tar Pits now are almost in the centre of bustling Los Angeles. This exhibit will show how the Pits may have looked 18 thousand years ago. Technician Gerry O'Connor adjusts the leg of a wolf, ripping at the bones of a giant ground sloth, trapped in the sticky tar. In the background is a curious horse. Paul Geraghty places a skull in the display, watched by another wolf.

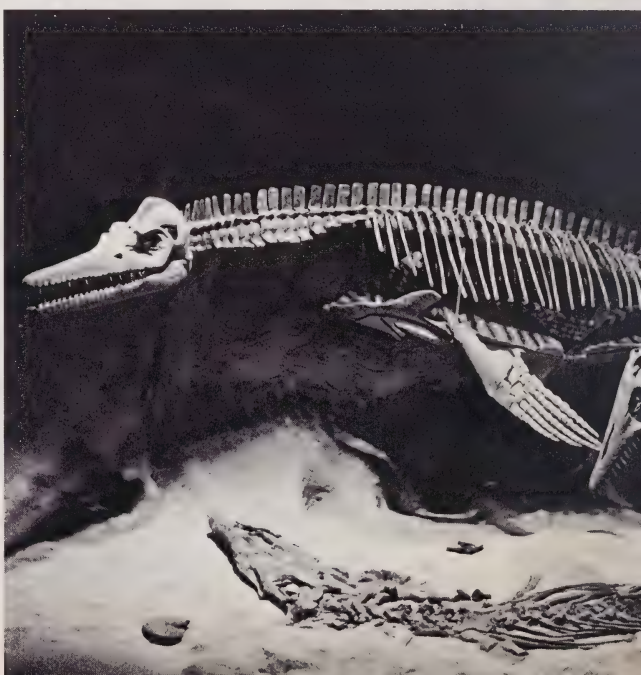
Snarling sabre-toothed cat lurks near the Tar Pit, intent on possible prey.

An exhibit that turns back the clock millions of years. On the right are three *Diceratherium*, distant relatives of the rhinoceros, who once galloped over a savanna area of Nebraska. In the upper left is *Teleoceros*, a larger, amphibious rhinoceros who existed about five million years ago.

Paleontologists' treasure trove was a bone pit found at Agate Springs, Nebraska. Three of these specimens were reconstructed from bones found in the pit.

A mosasaur, *Platecarpus*, dives to dine on the remains of another mosasaur, *Tylosaurus,* on the bottom of the vast inland sea which covered the centre of the North American continent, 70-100 million years ago.

While *Platecarpus* prepares to dine, a short-necked plesiosaur, *Dolichorhynchops*, cautiously investigates. Both the mosasaurs and the plesiosaurs became extinct at the end of the Cretaceous period at the same time the dinosaurs became extinct on land.



Man theorizes that all life evolved from the seas. Many forms became adapted for life on land and later several groups successfully returned to an aquatic life.

These new sections of the Vertebrate Paleontology Gallery at the ROM throw open their doors to visitors January 26. Next step in the ROM plans is reconstruction of the areas housing the dinosaurs such as *Corythosaurus*, long a major attraction.

This Ichthyosaur lived in the seas covering Germany 100 million years ago and probably resembled a modern porpoise.

PEOPLE ON POTS

An ancient Maya gallery

David M. Pendergast

Associate Curator,
Office of the Chief Archaeologist

Illustrations by Claus Breede

Two members of a ceremonial procession march past in full priestly regalia, with the apparent addition of masks. Each carries a long, feathered staff and bears the weight of a huge feathered headdress attached to a small cap. Suspended around each marcher's neck is a pendant or gorget, which might be shell. Though presumably a depiction of an actual ceremony, this scene and others of its kind cannot be fully identified. From a small bowl made between A.D. 550 and 600.

Wherever he works, the archaeologist is confronted by loss of information resulting from the destruction wrought by time and the elements. Perhaps nowhere in the world is this more sorely felt than in the countries of Central America which were once the homeland of Maya civilization. Here the heavy rainfall and ceaseless growth of vegetation have combined to strip away much of the splendour which filled ancient Maya life. Gone are the tools and ornaments, baskets, and other everyday objects, and with them the resplendent raiment of featherwork, cloth and animal skins which adorned the priest-rulers of the society. Only the imperishable parts of the ancient culture remain, and of these none is more fascinating than the great variety of beautifully-made pottery vessels.

The Museum's excavations at Altun Ha, British Honduras (Belize) have yielded nearly 600 such vessels, among them many prime examples of the potter's art. The whole vessels are accompanied by many tons of fragments, attesting to the importance of pottery among the ancient Maya. Fortunately for the archaeologist, this was not yet an age of mass-production and each ancient vessel is entirely handmade and unique.

This is especially true of ceremonial vessels decorated with elaborately painted scenes. Paintings were rarely repeated and never duplicated exactly. Never very common, such elaborately decorated vessels have been reduced in numbers through ancient breakage, either intentional or accidental, and often have suffered extensive damage as a result of humidity and root growth in tombs and burials. Nonetheless, many retain enough of their original colour to give us a feeling for the richness of the ancient ceramic tradition, and together with the large numbers of non-ceremonial vessels they constitute an important source of information on Maya life from the 3rd to the 10th Century A.D.

As pots were more fragile than other sorts of artifacts, breakage was high. The common custom was to toss the sherds onto a rubbish heap behind or beside each dwelling, so that great masses of discarded fragmentary vessels accumulated around the residences. The archaeologist's task consists of dissecting such heaps and sorting out the bits and pieces of vessels in the hope of eliciting information on their makers and users. For the lowest levels of Maya society, however, even this approach may prove fruitless, for the amounts of pottery in lower-class dumps are usually extremely small. It may well be that these people, prin-

A priest with typical Maya prominent nose and sloping forehead stands carved into the surface of a cylindrical vase. Why the protruding lips? We have no idea. About A.D. 600.

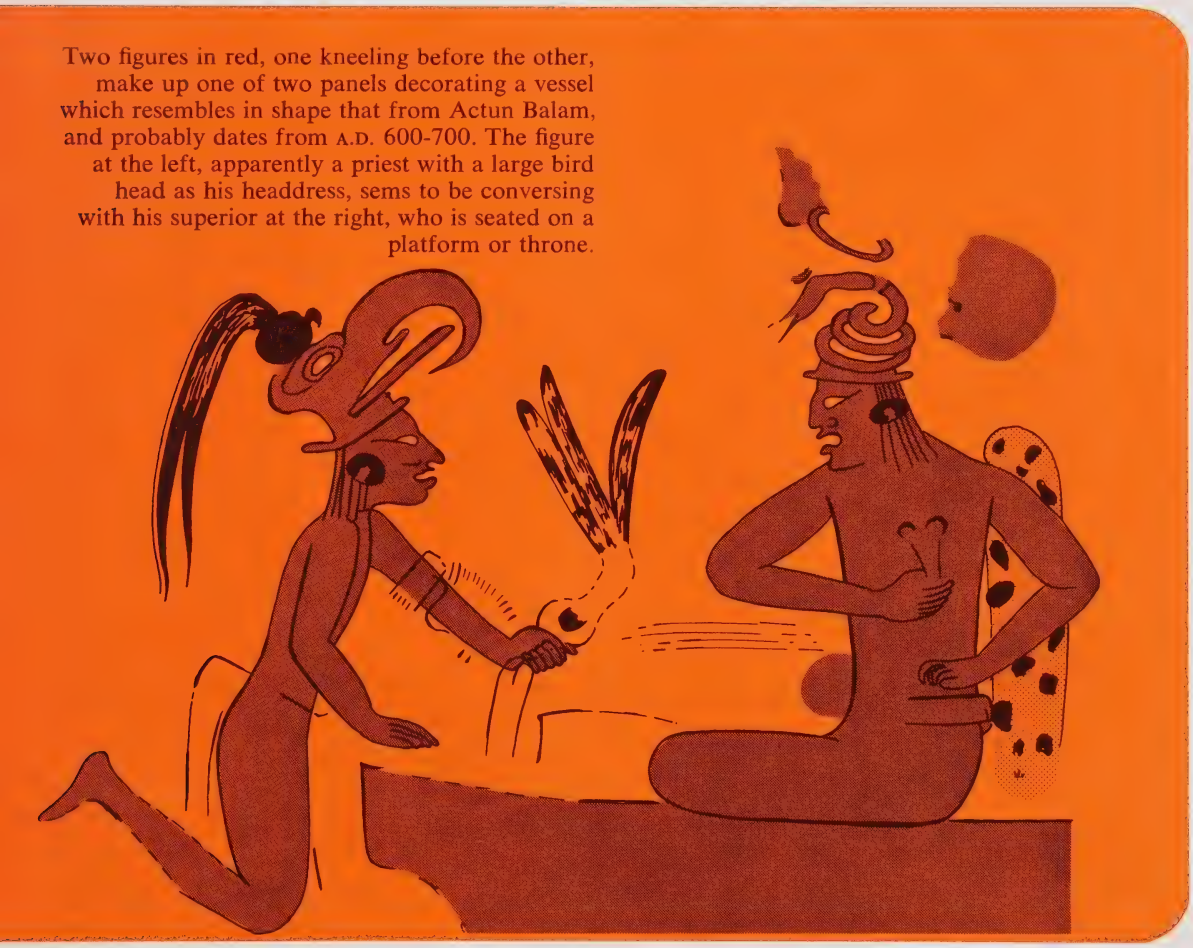
A true cartoon with some almost Thurber-like qualities, this small drawing scratched on a pottery fragment is probably the product of a few idle moments in some ancient Maya's daily routine. About A.D. 600.

cipally farmers, made little use of pottery except for storage vessels, depending instead upon gourds and wooden versions of the bowls and plates used by the upper classes. The position of such people at the bottom of the pecking order is reflected by the absence in their small refuse heaps of the sorts of elaborate vessels found in and near the centre of the site.

Around the platforms of middle-class houses clustered near the central ceremonial precinct of Altun Ha we encountered far larger and richer dumps than those occurring in outlying areas. The vessels represented in such dumps range from the simple, undecorated bowls, plates, and jars used in everyday cooking and storage to specialized forms such as the large platter-like devices on which corn tortillas were cooked. Mixed with these pots in some instances, but more often found with burials within the dwellings, were decorated vessels. The painted bowls, plates, cups, and vases falling into this category were almost certainly not in daily use, but rather were akin to our fine china, reserved for special use on special occasions. In most cases, the occasions probably were bound up in religion, the core of Maya existence.

While middle-class families enjoyed some ceramic luxury, the largest number of decorated vessels and the most finely painted pieces

Two figures in red, one kneeling before the other, make up one of two panels decorating a vessel which resembles in shape that from Actun Balam, and probably dates from A.D. 600-700. The figure at the left, apparently a priest with a large bird head as his headdress, sems to be conversing with his superior at the right, who is seated on a platform or throne.



were reserved for the priests who controlled Maya society. Though the priests apparently preferred to have their surroundings cleared of domestic refuse, we were fortunate enough to encounter two priestly dumps at Altun Ha, each containing staggering quantities of the finest wares. In many cases, we recovered vessels which must have been discarded in almost undamaged condition, a clear reflection of the abundance which characterized the lives of the priests. In discovering the dumps we filled in a large gap in our knowledge of decorated pottery, for painted vessels proved to be far rarer in priestly tombs than is true at most other Maya centres. For the first several years of the excavation programme we had the unhappy experience of encountering time and time again small bits of what had obviously been beautiful ceremonial vessels, without ever recovering such vessels intact and rarely discovering even a group of fragments which could be pieced together to form a reasonably complete pot. From this we knew that the potters of Altun Ha had been highly skilled at vessel painting, but we were almost always frustrated in attempts at recovering good examples of this skill on more than single sherds. Now, with specimens in hand such as those illustrated here, we have a range of depictions of costume and certain kinds of ancient activities which gives us a glimpse at the Maya people both as artists and as human beings.

The "gallery" of vessel paintings is not in any sense a collection of true portraits of actual people. While Maya civilization could boast of many skilled artists among the painters of pottery vessels, there were no Rembrandts or Gainsboroughs — no true portraitists. This is largely because the Maya had no great halls lined with painted likenesses of leaders or even minor bureaucrats nor in fact, as far as we can judge, any tradition of recording in paint the features of distinguished personages. Such records may exist on pottery vessels in a few cases, but they are a far cry from what we think of as portraits. Vessel paintings probably did not involve protracted sittings by the subjects, and were not commissioned by wealthy patrons or intended as mementoes for generations of descendants. They were, rather, depictions of ceremonially significant scenes, events, or individuals, created within limitations imposed by religious belief and artistic convention. Thus we have few really accurate portrayals of even the priests and no representa-

This vessel, typical of a great range of vases and bowls made at Altun Ha between about A.D. 600 and 700 and traded widely in the Maya area, has no human figures but is decorated with several human heads. The cartouches on the sides include oval elements which may be water symbols, while the faces in the rim band are glyphs, the meanings of which are unknown. Height 18.8 cm. (7⅜″).

An oddly-clad bound prisoner, perhaps awaiting the fate of a sacrificial victim shown on another part of the vessel, vents his wrath on one of his captors. The priest, with an unusual staff in one hand and a great feathered back-ornament attached to a girdle-like chestband, looks a bit surprised at the captive's action. Such scenes are extremely rare on Maya pottery. From Hoyuk, a site near the western border of British Honduras; about A.D. 900-1000.

A hunter, his spear poised atop a spearthrower in readiness for a shot at a deer shown out of view to the right, forms part of a procession on a vessel from Actun Balam cave in southwestern British Hondurus. The hunt is no ordinary one, and neither is the group of hunters. This fellow, probably identified by the crude glyph near his headdress, may be the god of rain and of life, germination, and fruitfulness. His participation in the deer hunt seems to have something to do with drought. Other figures, likewise deities, appear at his right and left. One of the great masterpieces of Maya ceramic art, the vessel dates from either A.D. 600-700 or A.D. 800-900.

A seated figure with simple clothing stretches forth his hands to a mysterious object which, like most of the rest of the scene, cannot be explained The facial features and head shape of the figure suggest that he is a human being rather than a deity, but even this is not certain. The mark on the sole of his foot may be a symbol of rank, but the significance of his seven toes is beyond comprehension. One of a pair of figures on a large bowl dating from between A.D. 550 and 600.

The vessel-mate of the seated figure above, this individual differs from his companion in almost every respect but position. The jaguar-skin loincloth, elaborate feathered back-ornament, and complex headdress may indicate a higher status, but it is possible that the two are simply different aspects of a single deity. In contrast to his partner, this figure has only four toes, but his left hand has one extra finger. The similar poses of these two figures and the two associated with shells (page 34) may indicate that this vessel scene is a less elaborate depiction of the Old God.

tions of the common people labouring in their cornfields or building temples. In fact, the complex esoteric nature of most of the scenes often requires extensive unravelling, a task that all too frequently proves impossible, leaving us with the pieces of the puzzle but no satisfactory solution.

Though often perplexing, the vessel scenes still provide information of great value and interest. First there are the priests' costumes, a vast and varied array of splendour from which some idea of the attainments of ancient Maya craftsmen, as well as the glories of the priesthood, can be obtained. Within this panoply is a hint at the existence of all sorts of craft specialists, for we assume that the priests had no hand in the manufacture of their elaborate garments. In almost any vessel scene one can detect the handiwork of weavers, skin-workers, woodcarvers, sandal-makers, feather-workers, rope-makers, and lapidaries, and with a little more imagination it is only a short step to the people who sought out raw materials with axe, snare, digging tool, or collecting bag. In a way the common people are present as well, though hidden behind the ceremonial scenes.

Present also, though perhaps not recog-

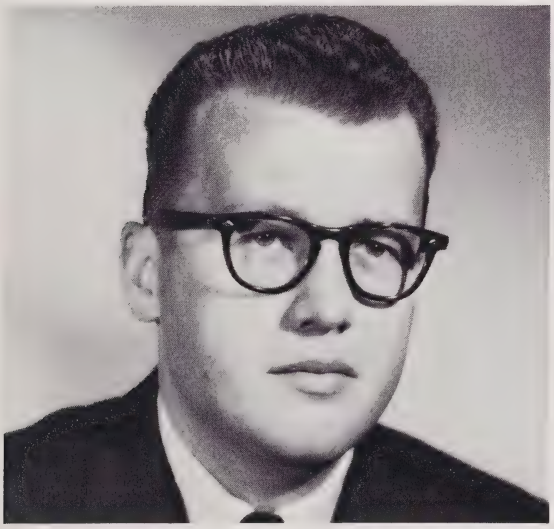
Surrounded by a vast array of decoration, a figure emerges from a shell. Comparison of this scene with examples from other sites indicates that the figure is the Old God, and the identification seems borne out by the flabby condition of this fellow's midsection. The deity's clothing is minimal, but clues to the nature of the scene abound in his surroundings. In addition to the shell, marine associations are indicated by the object with serrated edge which rises from the back of the shell, which is a water lily in full bloom. The oval elements scattered through the scene may be symbolic of water. With his outstretched arms, this figure resembles those on the vessel shown above, and like one of them he possesses six fingers on his left hand. From the same context as the other vessel, this bowl dates from between A.D. 550 and 600.

The second figure from the vessel likewise bears a shell on his back, and his toothless jaws give him the suitable appearance of age. Once again the water lily and oval elements are present, but in this case the figure reaches out with five-fingered hands for an object resembling those on the other vessel with a bow at its base. Like the other vessel scene, this one appears to underscore the importance of marine elements at Altun Ha.

nizable at first, are clues to the personality of the vessel painters and perhaps of the society as a whole. Out of the massiveness of Maya temples and the relentless struggle between the people and their jungle environment has grown a picture of the ancient Maya as a stolid, hardworking, patient people, little given to frivolity. Certainly there is much of this in the vessel paintings, but it is interlaced with touches of humour ranging from cartoon exaggeration of human features to less subtle efforts such as that on the Hoyuk bowl. When human nature creeps through ceremonial conventions in this way, we can be sure that the supposed rigidity of ancient Maya life was tempered with at least a modicum of individual freedom.

Many of the persons depicted on vessels are either deities or priests disguised as gods. Identification of the figures often poses insoluble problems even when there are short hieroglyphic texts present which may name or describe the personages. This is partly because we know less than we would like about the Maya pantheon and partly due to our inability to decipher more than bits of the glyphic texts. Beyond this problem are myriad small perplexing features, such as the extra fingers and toes shown on some of the figures. Possible explanations for this phenomenon are legion; the geneticist may view the added digits as an inherited trait for which there is unfortunately no skeletal evidence, while the art historian may see the matter as a product of artistic convention in portraying priest/deities, leading the prehistorian to speculate on the possible ceremonial significance of supernumerary phalanges. The real answer is, of course, that we have no idea at all why the extra digits are there, and we probably never shall have. Nonetheless this feature, like all of the others on the vessels, will be noted and filed away against the time when someone may come up with a solution to the puzzle. Until the time when all such puzzles have been solved, if that day ever comes, the little figures which sit, stand, and walk through vessel scenes are perhaps most useful and enjoyable as a means of bridging, however slimly, the great gulf which separates us from the ancient Maya.

Financial support for the Altun Ha excavations has come from the Riveredge Foundation of Calgary, the Wenner-Gren Foundation, and Canada Council.



Excavations at Altun Ha have ended for archaeologist David Pendergast but he is there for most of 1971 to work in pottery analysis. In practical terms this means sorting, classifying and describing several million potsherds. The pottery has been stored in crates in Altun Ha but Dr. Pendergast and his wife Esther expect to work in Belmopan, the new capital city of British Honduras (Belize). A welcome change from previous seasons at the jungle camp, is running water and electricity. They hope to complete the analysis within nine months.

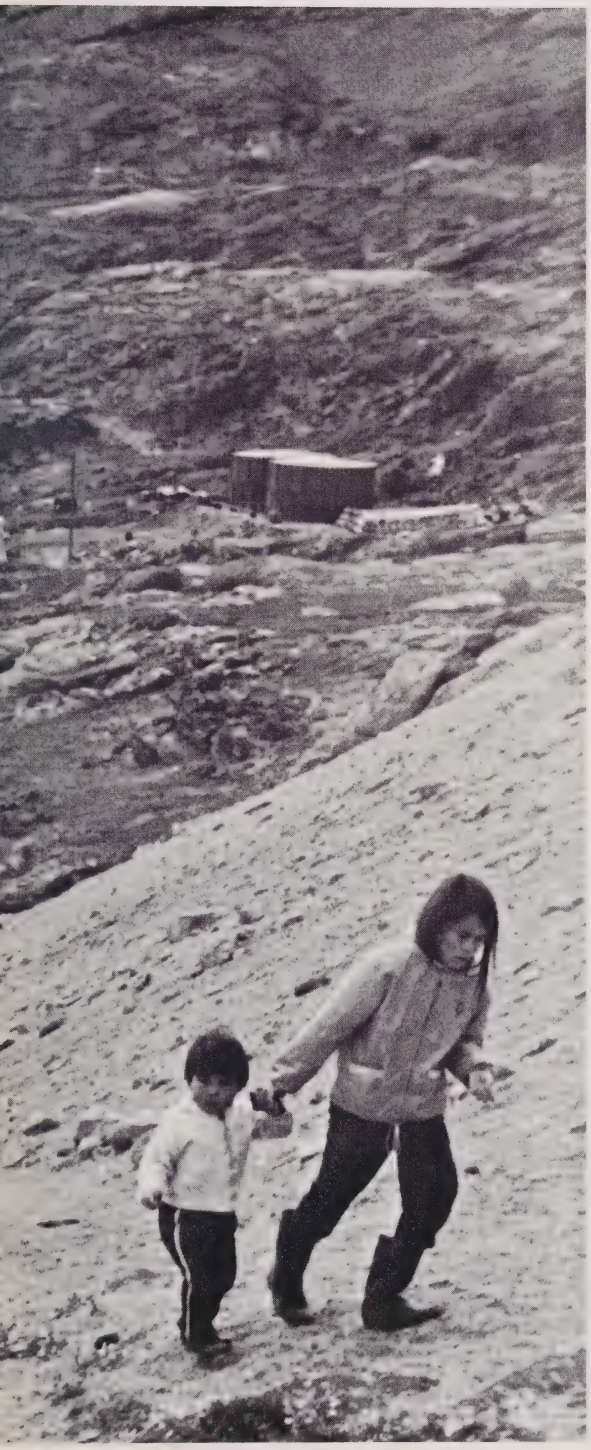
Camp on the Soper River north of Lake Harbour, Baffin Island.
The lapis lazuli deposit lies in the middle distance on the left.

LAPIS

in the midnight sun

V. B. Meen
Chief Mineralogist

Lake Harbour, Baffin Island. Looking south from the portage to Soper Lake.
Building at lower left is Hudson Bay Store.
Large long building in centre background is the new school.



New specimens are added continuously to an active museum's collections. Each contributes a fraction towards the advancement of knowledge — some more, some less. Some are collected by the museum staff, some by trade, some by gift, and some by purchase. But, however acquired the specimen must first have been collected by *somebody*. Unfortunately, all too often the experiences involved in the collecting go unrecorded and therefore the researcher or the museum visitor who, at some usually much later date, studies the specimen inevitably misses some of its interest, its excitement, even though that interest may not be scientific. Let me illustrate this by relating an incident which happened to me in early August of this year (1970). . . .

I awakened with a start. Outside the tent a vacant expanse of water greeted my eyes. Only hours before it had been a small stream bordered by low flat banks onto which our canoe had been drawn.

"Mikidjuk, the canoe is gone!" I yelled. Sudden commotion and the two Eskimos with our party erupted from the other small tent, stared in disbelief and were off across the tundra like Arctic hares. My partner, Don Hogarth, followed. Figuring that if the canoe could be retrieved at all, three could do it, I lit the stove and started to prepare breakfast. Win or lose, they would come back cold and wet from their search in the pelting rain. Soon I heard the sound of our 20 horsepower outboard. We were not going to be stranded in our camp on the Soper River in southern Baffin Island after all.

What has this to do with the Royal Ontario Museum and collecting?— Late in 1969, Dr. Donald D. Hogarth, Chairman of the Department of Geology at the University of Ottawa, dropped into my office and told me he had visited a deposit of lapis lazuli in Baffin Island. Lapis is a rock which contains the blue mineral lazurite and minor amounts of other minerals. Lazurite was the original source of the pigment ultramarine, and lapis lazuli has been prized for centuries as an ornamental and gem material. It is of rare occurrence, the main known

deposits being in Afghanistan, Siberia and Chile, with the relative merit of the three sources in that order.

Some time later, Dr. Hogarth sent me a specimen of the Baffin Island material. I was delighted but to my dismay found it to be badly fractured — an interesting mineral specimen but useless as an ornamental material because the shattering made it impossible to polish. In thanking Dr. Hogarth, I mentioned that I would welcome an opportunity to see the deposit and hopefully collect some material unshattered either by dynamite or frost action. He took me up on the suggestion and we planned a trip for 1970.

The first record of the Baffin Island occurrence was made by D. A. Nicholls of the Department of Mines and Resources. In the late 1930s he reported a deposit of lapis lazuli on the Soper River, about ten miles north of Lake Harbour. Two specimens of the material were added to the Royal Ontario Museum's mineral collection at that time. They exhibit much fracturing, probably due to frost. A third and sounder specimen was added in the early 1940s by a Baffin Island school teacher, Mr. John Hughes.

Early in 1968 the Department of Indian Affairs and Northern Development became interested in the lapis lazuli as a possible source of raw material for Eskimo craft works and saw to it that the deposit was staked in the name of the Eskimos of Lake Harbour. Unfortunately, the men sent by the Department to examine the material used dynamite. Dr. Hogarth visited the occurrence in 1968, and again in 1969 and made a geological map of it. In the spring of 1970 he contacted Mr. James D. Haining, now manager of the Industrial Division of the Baffin Region of the Government of the Northwest Territories, telling him of our interest and as a result we were invited to visit the occurrence in the summer of 1970.

Original plans called for us to fly from Mont-

Buildings at Lake Harbour, Baffin Island, showing new school. Small "match box" house in foreground is occupied by Eskimo couple who over the years have adopted seven daughters. Two seal skins dry against the wall.

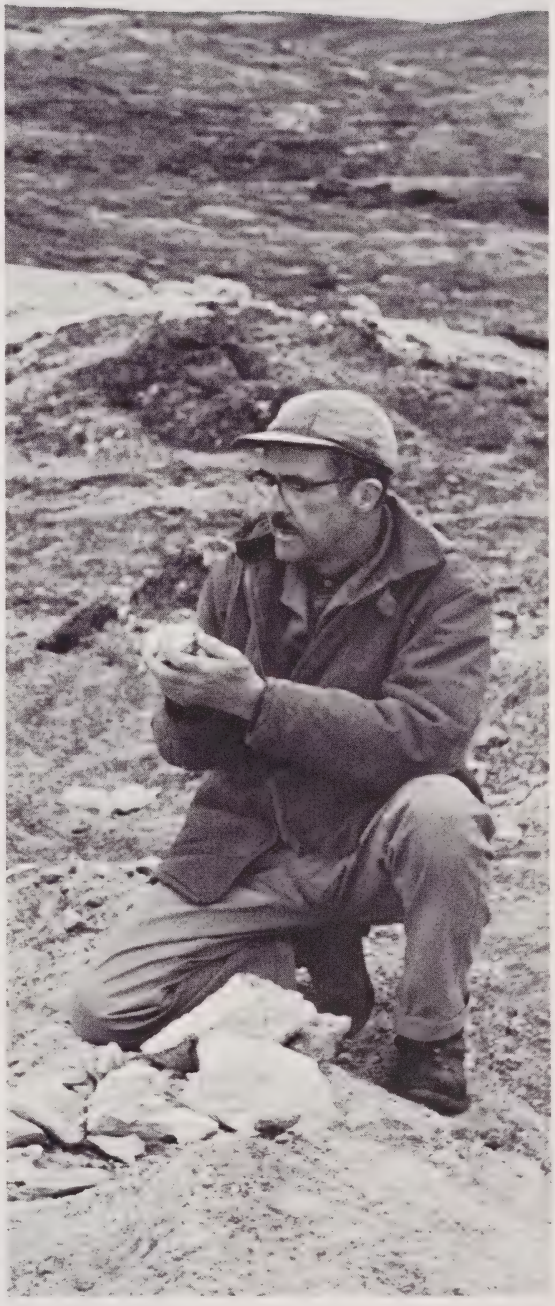
real to Frobisher Bay, Baffin Island, on Thursday, July 16. This was delayed one week because the plane to fly us on to Lake Harbour would "not be available." At noon on July 23 we arrived by Nordair's 737 jet at Frobisher, were met by Mr. Haining and lodged in Ritchie's Motel. Frobisher Inn was booked completely by a group of 60 Ford Motor dealers from the United States on a fishing expedition!

Then, we learned that transportation to Lake Harbour, some 80 miles south, would be further delayed because "the sand bar on the lake is under water." This sand bar at the north end of Soper Lake is the only available landing strip in the area and high water due to the spring run-off had covered it. No float-equipped planes were available. Spring comes late in Baffin Island. The ice had been gone for only about two weeks in Frobisher Bay and much snow still remained on the hills. Impatiently we waited for the water to recede.

When my wife and I visited Frobisher Bay in 1953 it was a joint United States-Canada air base and radar site. Now it is the capital of the Eastern Arctic, with Government buildings, hospital, hotel, eight-floor apartment building, and a town-site of single dwellings and town houses. I was able to pick up the telephone, give the operator my home phone number and within seconds talk to my wife. She mentioned Toronto's 95-degree temperature. We were shivering at 45 degrees.

On Sunday, July 26, we loaded our equipment into an Otter aircraft equipped with large soft tires. Within minutes we were over frozen lakes. Ahead, heavy clouds sat solidly on the 2,500 foot hills of southern Baffin Island. No holes through to Lake Harbour could be found. Back we went to Frobisher. After lunch we were alerted once more, but just before take-off came word that the sand bar was once more under water. Back to Ritchie's. Four days later, a twin-engine Beechcraft on floats set down in Frobisher Bay and was chartered by Mr. Haining to fly us to Lake Harbour. At 9:45 p.m., in the lovely Arctic twilight, we arrived there and were put up at the hostel.

Lake Harbour is a settlement of about 190



The author, dressed for 45 degree mid-summer weather, examines specimen of lapis lazuli.

Eskimos and 10 whites, clinging to the rocky shore of a bay which opens into Hudson Strait, about 10 miles to the south. In 1969 the Government built a school and a two-storey hostel building where children from neighbourhood camps could live while attending school. No children came. So the hostel is available to travellers such as Hogarth and Meen. The Government also erected homes which are rented to the villagers.

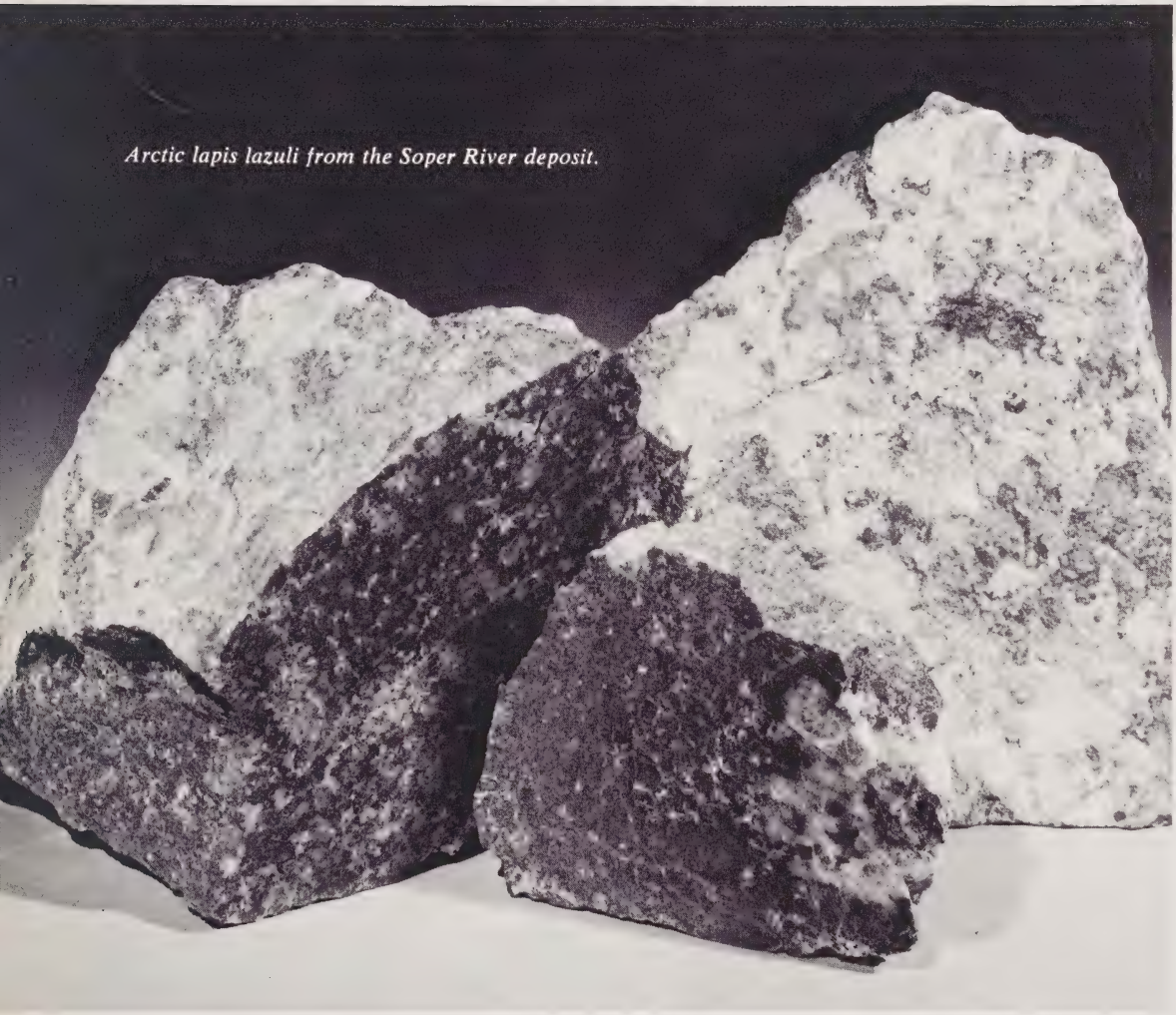
Next morning, we bought supplies from the Hudson's Bay Company Store and portaged over to Soper Lake. Mikidjuk and Eliyah met us with a 19-foot freighter canoe and a 20 horsepower motor. As we loaded the canoe, the Otter made its first landing in four weeks on the sand bar, which had once more appeared above the water. We passed this makeshift airstrip as we approached the portage around Soper Falls at the upper end of the lake. Here we waited while our helpers went back to Lake Harbour for reinforcements to help them carry our big canoe over the portage. While waiting, we had time to view the magnificent chute of boiling white water as it roars through its white marble canyon. The top end of the portage is right at the lip of the chute. Engine failure there would bring instant disaster. Finally over the portage and on up the river, we arrived at our campsite about 8 o'clock, pitched our Eskimo-type tents, cooked dinner and tumbled into our sleeping bags. Darkness lasted for only a couple of hours around midnight and there was a heavy frost.

After breakfast Saturday, we set off for the lapis lazuli deposit. Actually it consists of two deposits, about a mile apart, across the barren tundra. It was a beautiful arctic day but that night it started to rain. Sunday and Monday provided a few periods when the weather improved to "intermittent showers!" It was steady rain through Tuesday and Wednesday. We were wet and cold. The Hudson's Bay Store had sold us leaded gasoline so we could not use the stove for heating the tent! When not at work on the deposit, we climbed into our sleeping bags for warmth. It was this steady rain which had raised the level of Soper River about five feet and floated off our canoe while we slept. We packed camp at noon on Wednesday and headed for Lake Harbour. Back in Soper Lake we found that once more the sand bar airstrip had disappeared.

About 4:30 p.m. we staggered into the hostel, soaked and numb with cold. Wonder of wonders, the hostel boasts two bathtubs! After a hot bath and a stiff drink our optimism returned. "All we need is a few days good weather; the level of Soper Lake will drop once again and the plane can come to the sand bar for us and we can continue our trip home."

But what about the lapis? In spite of the weather, we did a lot of work on the two deposits. Mikidjuk and Eliyah dug trenches

Ritchie's Motel, Frobisher Bay, Baffin Island. The control tower and hanger of the busy airport are visible above the double garage to the left. The two-mile-long air strip is prepared to take on jets of all sizes.



Arctic lapis lazuli from the Soper River deposit.

across it and Don and I added more to the survey which he had begun on earlier visits. Several hundred pounds of usable material are now stock-piled there and a similar amount should be available without too much effort and without the use of dynamite. It is our hope and our recommendation to Mr. Haining that steps be taken to teach some of the Eskimos of Lake Harbour the essentials of the lapidary's art so that a new craft using this native material may develop.

In my pack as I left the deposit for home were a few pieces representative of the deposit. In addition was one piece two inches thick and about 8″ by 10″ on the flat surface. If this will take a fine polish then we will be assured that Canada has a deposit of lapis lazuli at least equivalent in colour and usability to that from Chile; we may have a small industry for the Lake Harbour Eskimos and in addition, another specimen was added to the collections of the Royal Ontario Museum.

The ROM staff and friends of Victor B. Meen were grieved by his death Thursday, January 7, 1971.

Dr. Meen was Chief Mineralogist at the ROM and previously had made four trips to the Canadian Arctic, not in search of gems but to study the Chubb and Merewether Craters. His study of minerals had taken him to almost every corner of the world including Russia and the Orient. In 1966 Dr. Meen and Dr. A. D. Tushingham, ROM's Chief Archaeologist, were the first to intensively study and catalogue the incomparable Crown Jewels of Iran. For many years Dr. Meen held dual appointments at the ROM and in the Department of Geological Sciences at University of Toronto.

Recent Publications

The colossal gold and ivory statue of Athena, created by Phidias to stand in her temple on the Acropolis, was the symbol of Periclean Athens from the date of its erection in 438 B.C. The great statue also functioned as the treasury of Athens, for most of the gold could be removed and melted into currency in times of need. The Athens Public Life Gallery in the ROM is enriched by a 10:1 reconstruction of Athena Parthenos, researched by Neda Leipen and created by Sylvia Hahn (1962). ATHENA PARTHENOS: A RECONSTRUCTION examines the archaeological evidence of almost 70 replicas, jewels, terracottas and coins, and the citations in classical literature upon which the ROM's scale model reconstruction was based. (ATHENA PARTHENOS: A RECONSTRUCTION by Neda Leipen, Curator, Greek and Roman Department, ROM; $6.00)

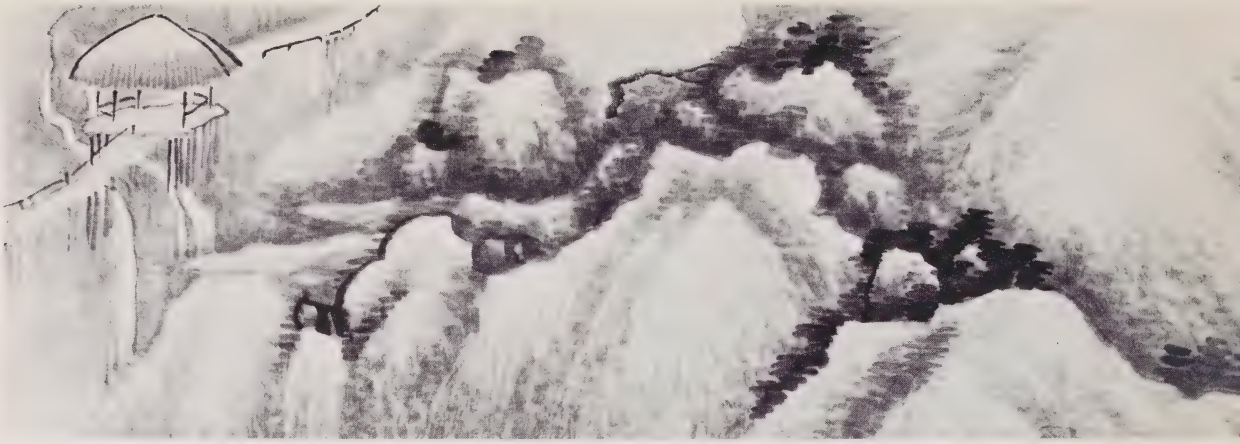
What was the Christmas Star? In late November, the ROM published a booklet in which H. C. King, Curator of the McLaughlin Planetarium, examines the available evidence in the light of scientific knowledge past and present. (THE CHRISTMAS STAR, paperbound, 50¢)

The puzzle of Eduardo Quiroz cave is that it lies at a fair distance from known habitable areas in British Honduras (Belize), yet was modified by the Maya for both ceremonial use and human habitation. D. M. Pendergast, Associate Curator in the Office of the Chief Archaeologist, attempts to unravel the time sequence of ceremonial disposal of sacred vessels, primitive garbage pits, and six burials in material accumulated on the cave floor. (EXCAVATIONS AT EDUARDO QUIROZ CAVE, BRITISH HONDURAS (BELIZE); ROM Art and Archaeology Occasional Paper 21, paperbound, $4.00)

How is it possible to survive in one of the harshest regions of the earth? THE CANADIAN ESKIMOS, by Dr. J. G. Taylor, Assistant Curator in the ROM Department of Ethnology, is an overview of the peoples of the Canadian Arctic. It describes the Eskimos' dependence upon the sea and the land for food, clothing, shelter, and weapons, and complements the six preceding handbooks by E. S. Rogers on the Indians of Canada (ROTUNDA, Fall 1970). (THE CANADIAN ESKIMOS, paperbound, 50¢)

The Growing Collections

A finger-painting by I Kai (Ifukyu, 18th century) is one of five Chinese and seven Japanese paintings and two pieces of Japanese calligraphy recently acquired by the Far Eastern Department.



Others are two 12-leaf albums of flower paintings, by Ch'en Hung-shou (1599-1652) and Chou Hao (1675-1763); landscape album leaf mounted as hanging scroll by Kung Hsien (17th century)—illustrated above; landscape hanging scroll, by Lan Ying (1585—after 1637); 16 arhats album leaf by Wu Pin (16th century); landscape hanging scrolls by Minagawa Gen (Kien, 1734-1807), Noro Ryu (Kaiseki, 1747-49-1828), Sakai Shin-en (Hyakusen, 1698-1753), Satake Sadakichi (Kaikei, 1738-1790); a large landscape hanging scroll of later 17th century Kano School; bamboos in wind hanging scroll by Yoshida Aioka (Zotaku, 1722-1802); and waka calligraphy hanging scroll by Karasuma Mitsuhiro (17th century).

Limited display space will permit the showing of only a few of these at a time, on a rotating schedule.

273 specimens have been registered into the mineral collections since May, 1970. Of these, four species not previously represented have been acquired—antarcticite, buddingtonite, nissonite and sjogrenite. A superb collection of Lake Superior agates from Michipicoten Island, lent to the Museum by two Toronto collectors, Tasso and Gert Komossa, will be displayed in the Mineralogy Gallery until March 1971. The fine fluorite specimen (18 x 10 cms.) found near Rossport, Ontario and illustrated here, was donated by Mr. Heinz Weltner. A very unusual crystal of red beryl was donated by Mrs. Kay Robertson of California.

From 11 red boxes, a 38½-foot Black Brant IV B high altitude research sounding rocket has been assembled and placed on display in the McLaughlin Planetarium. The red, white-striped Black Brant is on permanent loan from Bristol Aerospace (1968) of Winnipeg. The IV B, one of the largest of the Black Brant family, is capable of carrying an 84 lb. payload to an altitude of 660 miles. Black Brants have been launched from Wallops Island, U.S.A., Natal, Brazil and Churchill Research Range, Manitoba.

The coat-mantle (cifraszür) of the Hungarian peasants, shepherds, d cattlemen is a very ancient type of garment which went out of yle in the seventeenth century. It was revived in the last third of the neteenth century, and examples for this period are highly decorated. ne first were embroidered, but from about 1870, this method was eadily replaced by cut-out designs applied by sewing machine.

The ROM Textile Department cattleman's coat is a later example ate 19th century) of high quality. The type and placing of the otifs display the old traditions.

It was made on the border of the Hungarian Great Plain, an nmensely rich agricultural area famous for wheat and cattle. A man ould own only one such coat in his lifetime, and it was his best othing, always worn on special and festive occasions. As it was ustomary for the owner to be buried in the one he owned, the ROM as been extremely fortunate in acquiring this example.

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